



(RESEARCH ARTICLE)



Traditional medicine in the treatment of bovine diseases in Northern Côte d'Ivoire

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Publication history: Received on 03 May 2020; revised on 12 May 2020; accepted on 14 May 2020

Article DOI: <https://doi.org/10.30574/wjarr.2020.6.2.0139>

Abstract

Traditional practices involved in veterinary care are common, but are gradually disappearing because they are not being passed on to the younger generation. The present study aims to safeguard and enhance, through documentation, the knowledge as well as the ethno-medicinal veterinary practices rich in recipes, which tend to be lost or even disappear. Thus, an ethnoveterinary survey, conducted in the North of Côte d'Ivoire among 50 livestock breeders in three sub-prefectures of the Ferkessédougou department, reveals 34 types of recipes using 25 species of plants divided into 17 families and 21 genera. The most dominant families are the Meliaceae (23.53%). Among the organs of all the listed plants, the leaves are the most used (32.43%), and the majority of the remedies are obtained by decoction (56.67%). Most of the diseases treated are diarrhoea and malaria, with a rate of 17.07%; stomach aches, rum, foot and mouth disease and intestinal worms, each representing 7.31%. The oral route is the most commonly used method of administration (93%). The results obtained may constitute a database for further research that could reveal the efficacy of these plants.

Keywords: Medicinal plants; Côte d'Ivoire; Ethnoveterinary; Cattle; Ferkessédougou

1 Introduction

All over the world, as long as the history of mankind goes back, the proximity of Man to his environment has allowed him to develop a certain amount of knowledge in the field of medicine with plants. Even before the advent of chemotherapy [1], he was able to deal with the most common conditions that pose problems of morbidity and mortality. In Africa, after independence, traditional livestock farming was the only source of production and supply of poultry, cattle and sheep products.

In Côte d'Ivoire, livestock farming is still a developing economic activity, contributing about 4.5% to agricultural gross national product (PIB) and 2% to total (PIB) [2]. Moreover, cattle breeding remains 95% dominated by traditional practices [3]. It contributes to improving food security, diversifying and increasing the income of farmers and herders [2]. In the Ferkessédougou department, livestock farming is an important economic activity. Poor soil conditions have led the people of this northern region of Côte d'Ivoire, once described as savannah, to practice livestock rearing rather than agriculture.

In addition, the estimated 83% of the cattle population in the North is of five genetic types [4]. However, this sector of activity is experiencing enormous difficulties. Parasitic diseases [5] due to lack of care and insufficient fodder, especially in the dry season, are among the main causes of loss of animal life and low meat production. In order to ensure the health of their animals, farmers, who have a great deal of traditional knowledge, use certain plant species for veterinary

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purposes without having to resort to expensive modern pharmaceuticals. This system of care, known as veterinary ethnomedicine, has a prominent place among various pastoral peoples.

Indeed, the interest aroused by phytotherapy to overcome gastric problems and parasitic diseases, by the traditional herders of this Department, lies in the fact that the drugs used are easy to access and to prepare, moreover, their medicinal properties are recognized.

In spite of the growing interest in the research community on medicinal plants, very few indications are provided in the literature regarding traditional veterinary medicine in northern Côte d'Ivoire. Only [6], [7] and [5] are devoted to traditional practices in veterinary care. In response to this situation, a study was carried out on plants for medicinal use in cattle rearing systems in the Department of Ferkessédougou, a town located in the north of Côte d'Ivoire. The objective of this work is to safeguard and enhance through documentation, knowledge and recipient-rich ethno-medicinal veterinary practices, which tend to be gradually lost or even disappear.

2 Material and methods

2.1 Study environment

The study was carried out in Côte d'Ivoire, in the department of Ferkessédougou, located at 9°32 north latitude and 6°29 west longitude. The department covers an area of 3220 km² (fig. 1) and is bordered to the south by the department of Niankaramandougou, to the east by the department of Kong, to the west by the department of Sinémantiali and to the north by the department of Ouangolodougou. It borders Mali and Burkina Faso. In the department of Ferkessédougou, 3 communes namely Ferkessédougou, Togoniere, and Koumbala have been selected. The choice of these communes is due to the fact that data from the livestock census conducted in the department showed a high concentration of cattle.

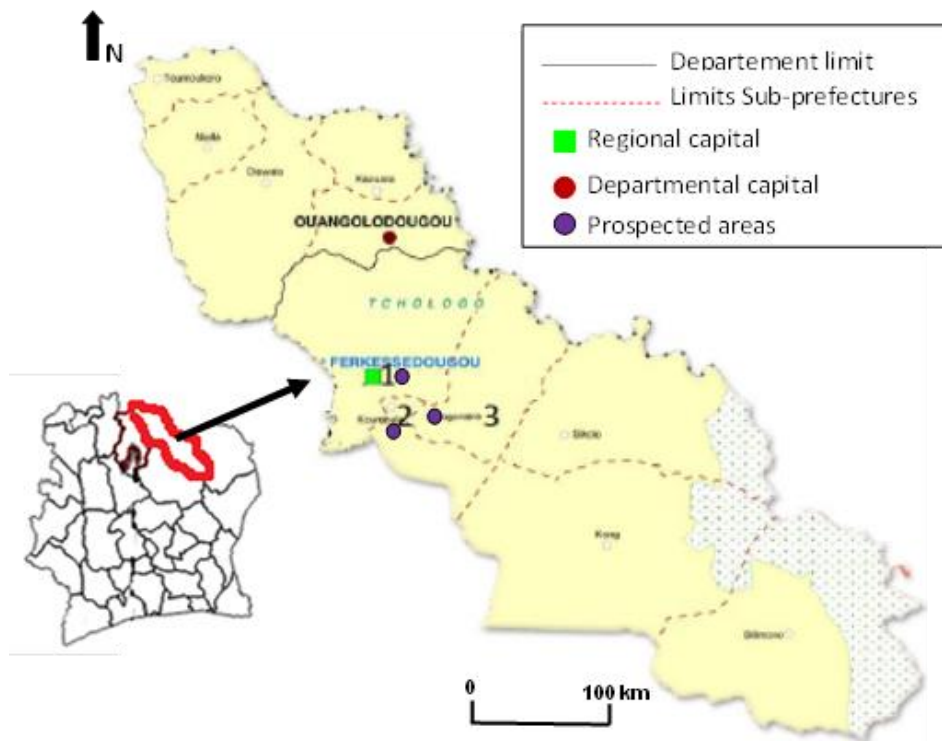


Figure 1 Map of the Ferkessédougou department

2.2 Technical materials

In order to have as much information as possible about the use of medicinal plants for veterinary purposes, we used survey sheets to collect information from farmers and specialized healers; a camera for taking pictures; pruning shears; plastic bags to collect plant samples; newspaper and cardboard folders for making herbariums; labels to number plant samples; a pen; a notepad for taking notes and a computer for recording and processing data.

2.3 Methods

2.3.1 Ethnobotanical survey method

This study was preceded by a pre-investigation, during which the authorities of the Department were approached and informed of the project. Then it was the turn of the various associations of livestock farmers and healers who often treat veterinary diseases in the Department.

Surveys of veterinary plants began directly at the farm sites, during transhumance and among experienced healers, using the semi-direct interview technique, in which the respondent is asked to answer questions. A total of 50 peoples were interviewed. An interpreter was needed during the interviews, as they sometimes took place in the local language. Each interviewee was interviewed three times in order to verify the consistency of the information received. Information on a veterinary plant included information on diseases frequently contracted, the local name of the plant, the part used, the method of preparation and the method of administration or use.

2.3.2 Botanical Nomenclature

Herbarium samples were collected and the identification of the listed plants was made thanks to the flora of Côte d'Ivoire [8, 9] and the work of [10]. The nomenclature according to [11] was used for the harmonization of the names of the listed plant species.

2.3.3 Analysis of the data

The various data collected were subjected to elementary descriptive statistical analyses. These analyses were carried out using Excel 2013 software.

3 Results

3.1 Ethnobotanical study

Ethnobotanical surveys conducted in the three localities of the Department of Ferkessédougou identified 25 medicinal plants and 34 recipes that are used to treat various health problems in cattle. These plants are divided into 21 genera and 17 families (Table 1). The plants are grouped into species, with families, local names, organs used, and methods of preparation and administration. From the point of view of species richness, the best represented families are Meliaceae (23.53%), Mimosaceae, Malvaceae, Fabaceae, Sapotaceae, Annonaceae, each with 17.65%, and Caesalpiniaceae, Caricaceae, Rubiaceae, Solanaceae with 11.76%. During the survey, some plants were mentioned several times, due to the frequency of their use. These were *Khaya senegalensis*, *Vitellaria paradoxa*, *Annona senegalensis*, *Parkia biglobosa*.

3.2 Main diseases affecting livestock in the department

This survey identified a total of 15 veterinary pathologies, mentioned by farmers and healers. According to the respondents, the observed symptoms are classified according to their importance. Thus, diarrhoea and malaria are the most frequent diseases with a rate of 17.07% each, and for which 5 and 4 plants respectively were reported. For other diseases, farmers indicated 3 plants for stomach aches, rum, foot and mouth disease, intestinal worms, with a rate each of 7.31% and 2 plants for symptoms such as eye infections, ticks and broken horns with a respective rate of 4.88%. Against infertility, cough, external and hoof wounds, with a rate of 2.44% each, only one plant was indicated (fig. 2).

3.3 Parts used

In the localities visited, remedies are frequently made from leaves (32.43%), bark (27.52%) and fruit (18.45%). The other vegetable parts used represent 21.6% (fig. 3).

3.4 Method of preparation and administration of remedies

Remedies are generally made from fresh or dried plant drugs, either from a single plant or a combination of plants, which are used mainly in the form of decoctions (56.67%), powders (20%), juices (10%), macerations (10%) and grindings (3.33%) (fig. 4). Ingredients such as lemon, vinegar, eggs, millet bran, red oil and lice are often used in some recipes. Remedies are administered orally in 93% of cases, with fumigation and poultice representing 4% and 3% respectively (fig. 5). For the herbs indicated, no side effects were reported.

Table 1 Medicinal Plants and their Uses in Cattle Breeding Systems

Species	Family	Local name	Diseases	Organs	Preparation and Administration
<i>Khaya senegalensis</i> (Desr.) A. Juss. .	Meliaceae	Djaraviri	Scabies	Bark	Decoction + Lemon juice to drink (2 coffee glass once / day)
<i>Piliostigma thonningii</i> Schummah. Milne-Redh.	Caesalpiniaceae	Olofoo	Diarrhoea	Leaves	Decoction + Lemon juice to drink (1 coffee glass)
<i>Sida acuta</i> Burm.f.	Malvaceae	Tchègbènebalier		Leaves	Decoction to drink, 2 coffee glasses
<i>Detarium microcarpum</i> Guill. & Perr	Cesalpiniaceae	Gbogbo		Leaves	Decoction to drink (2 coffee glasses; 1 time / day)
<i>Vitellaria paradoxa</i> C. F. Gaertn	Sapotaceae	Soun vime		Stem	Charcoal (drink), to drink; (1 glass)
<i>Feretia apodanthera</i> Delile	Rubiaceae	Commby		Root	Macerate + millet flour to drink (2 glasses of tea)
<i>Gossypium sp.</i>	Malvaceae	Lomouroutantigué	Constipation	Fruit	Juice + vinegar to drink (2 glasses of tea)
<i>Elaeis guineensis</i> Jacq.	Arecaceae	Téntigue		Fruit	Red drinking oil (1 coffee glass)
<i>Carica papaya</i> L.	Caricaceae	Mahandié	Stomach aches	Bark	Décoction à boire (1 verre / Jour)
<i>Parkia biglobosa</i> (Jacq.) R. Br	Mimosaceae	Néré		Bark	Decoction to drink (1 glass / Day)
<i>Annona senegalensis</i> Pers.	Annonaceae	Sousoungb-gbeni		Stem	Decoction to drink, 1 glass 2 times / Day
<i>Gossypium sp.</i>	Malvaceae	Lomouroutantigué	Cold	Fruit	Put the juice in the nostrils
<i>Allium cepa</i> L.	Liliaceae	Djabalo		Bulb	Put the juice in the nostrils
<i>Cassia occidentalis</i> (L.) Link	Fabaceae	Kinkeliba tcheman		Leaves	Decoction to be drunk; 2 coffee glasses / Day
<i>Annona senegalensis</i> pers	Annonaceae	Sousoungb-gbeni	Eye infections	Bark	Macerate and put drops on the eyes
<i>Cola acuminata</i> (P. Beauv.) Schott & Endl.	Sterculiaceae	Worotigue		Fruit	Apply the powder to the eyes
<i>Nicotiana tabacum</i> L.	Solanaceae	Tahaba	Foot-and-mouth disease	Leaves	Drinking decoction (2 coffee glasses / day)
<i>Parkia biglobosa</i> R. Br	Mimosaceae	Néré		Fruit	Give the powder to the animal
<i>Nicotiana tabacum</i> L.	Solanaceae	Tahaba		Leaves	Fumigation (evenings)
<i>Vitellaria paradoxa</i> C.F. Gaertn	Sapotaceae	Soun vime	Sterility	Stem marrow	Macerate + Fresh egg + 1 lice (to drink)
<i>Khaya senegalensis</i> (Desr.) A. Juss.	Meliaceae	Djaraviri	Malaria	Bark	Drinking decoction (1/2 liter / Days)
<i>Annona senegalensis</i> Pers.	Annonaceae	Sousoungb-gbeni		Root-leaves	Drinking decoction (1 glass, 3 times / day)
<i>Cassia hirsuta</i> L.	Fabaceae	Kinkeliba moussoman		Leaves	Drinking decoction (1/2 liter / Days)
<i>Vitellaria paradoxa</i> C. F. Gaertn.	Sapotaceae	Soun vime		Bark	Drinking decoction (1/2 liter, 2 times / day)

<i>Phyllanthus pentandrus</i> Schumach. & Thonn.	Phyllanthaceae	Barboube	Horn breakage	Leaves	Apply the powder on the break
<i>Mitragyna inermis</i> Willd.	Rubiaceae	Koylie ou liyirimin		Leaves	Apply the powder on the break
<i>Carica papaya</i> . L.	Caricaceae	Magandjé	Intestinal worms	Seed (seeds)	Broyat (drink) to drink, one glass / Day
<i>Khaya senegalensis</i> (Desr.) A. Juss.	Meliaceae	Djaraviri		Bark	Powder + crushed corn (to eat)
<i>Cassia siamea</i> Lam.	Fabaceae	Cassia		Leaves	Drinking decoction, 1 glass 2 times / day
<i>Anogeissus leiocarpus</i> Guill. & Perr.	Combretaceae	Guenmin	Cough	Trunk-bark	Drinking decoction (1/4 liter; 3 times / day)
<i>Ficus vallis-choudae</i> Delile.	Moraceae	Yibbé	Ticks	Trunk-bark	Drinking decoction 1/2 liter, 2 times / day
<i>Anthostema senegalense</i> A. Juss	Euphorbiaceae	Lakonemon		Leaves	Drinking decoction (1 coffee glass / day)
<i>Parkia biglobosa</i> R. Br	Mimosaceae	Néré	Hoof wound	Fruit	Applying the powder to the wound
<i>Khaya senegalensis</i> (Desr.) A. Juss.	Meliaceae	Djaraviri	External wound	Bark	Poultice

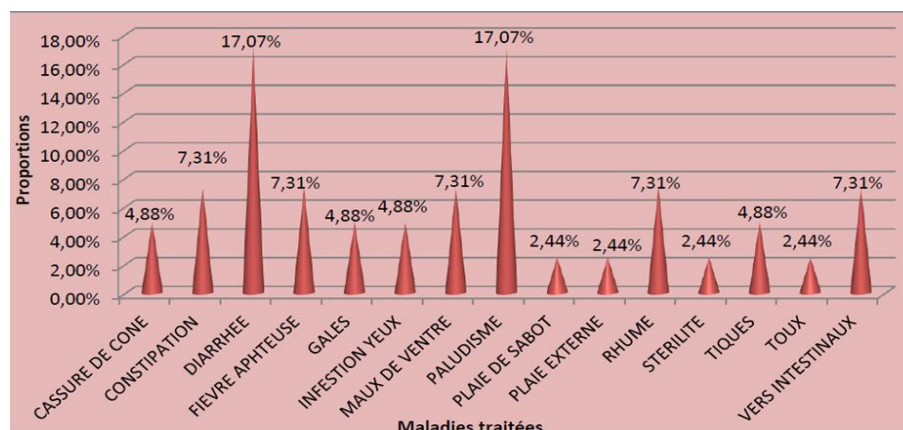


Figure 2 Different diseases treated by plants in cattle breeding

English name of the various diseases which are cited in French in Figure 2

French	English	French	English
Cassure de corne	Horn break	Plaie de sabot	Hoof wound
Constipation	Constipation	Plaie externe	External wound
Diarrhée	diarrhoea	Rhume	Cold
Fièvre aphteuse	Foot-and-mouth disease	Stérilité	Sterility
Gales	Scabies	Tiques	Ticks
Infection yeux	Eye infection	Toux	Cough
Maux de ventre	Stomach aches	Vers intestinaux	Intestinal worms
Paludisme	Malaria		

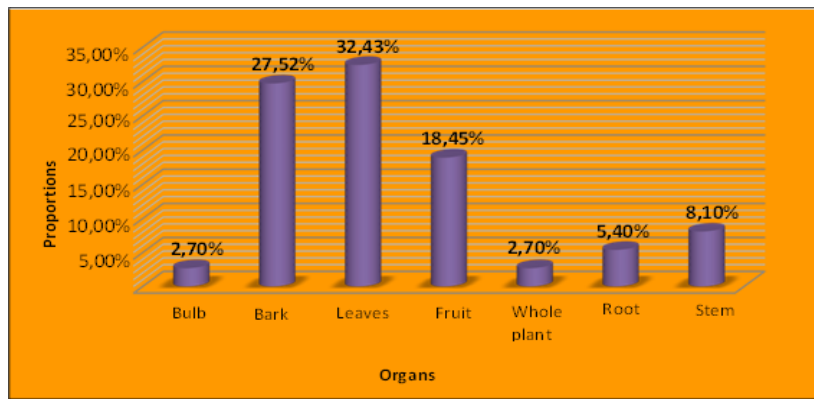


Figure 3 Proportion of plant organs used for processing cattle

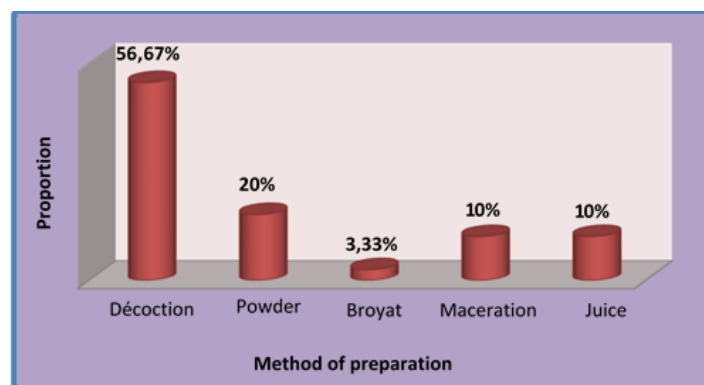


Figure 4 Proportion of different methods of making remedies for cattle.

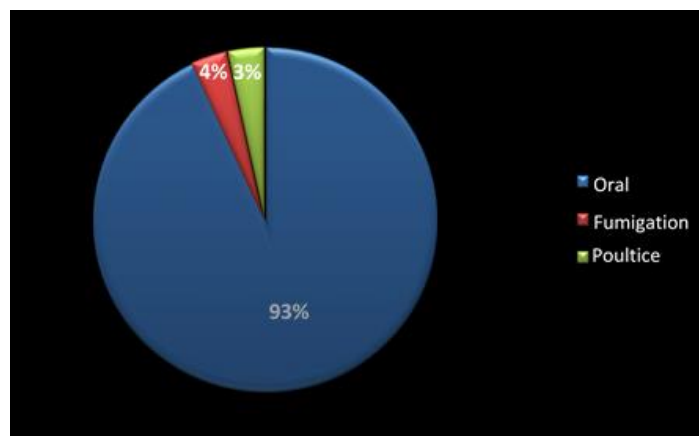


Figure 5 Proportion of different methods of administering remedies in cattle.

4 Discussion

Ethno-veterinary surveys on the treatment of bovine diseases in the Ferkessédougou zone have identified 25 medicinal plants that are used in the preparation of 34 drug recipes, which are used in the prevention and treatment of 15 diseases, with a view to improving animal production. However, the low quantity of plants inventoried could be explained by the fact that the Ferkessédougou department has undergone modernization in recent decades, leading herders to abandon much of their traditional veterinary practice in favour of conventional veterinary medicine. It could also be explained by the abusive and uncontrolled exploitation of the plant resources of this region, which has led to the disappearance of several medicinal plants. In addition, the survey revealed that the herders, who are mostly Fulani, have a great deal

of knowledge and mastery of medicinal plants, but they are not very open, especially when it comes to passing on the knowledge they possess. Moreover, these herders and healers remain more attached to traditional human rather than veterinary medicine. These results confirm the work of [7], carried out in the same Department. However, the use of medicinal plants by herders has not completely disappeared. They are used by them to administer first aid to animals. Thus, for the treatment of the most widespread diseases or symptoms, various ethno-veterinary recipes based on plants have been identified. The species *Vitellaria paradoxa* has been cited by farmers in cases of diarrhoea and malaria. *Khaya senegalensis* is involved in the therapeutic indication of intestinal worms and malaria. This confirms the observations made by [12] which indicate the confirmed use of these plants in the treatment of these bovine diseases. It is also noted that some of the same plants can be used to treat several pathologies. This is the case, apart from *Vitellaria paradoxa* and *Khaya senegalensis*, of *Carica papaya* for intestinal worms and bellyache. *Annona senegalensis* is indicated for stomach aches, eye infections and malaria. Among the plant species listed, some are also used to treat other identified pathologies. For example, there are species such as *Nicotiana tabacum* and *Parkia biglobosa* used in the treatment of foot and mouth disease, *Annona senegalensis* and *Cola acuminata* used for eye problems or *Ficus vallis-choudae* and *Anthostema senegalense* to treat ticks. For the preparation of the remedies, the breeders and healers harvest the parts of the plant that are used in the preparation of the recipe. The leaves are the most commonly used organs in the various medicinal preparations with a proportion of 32.43%, as shown in [13] and [4]. This high use of leaves can be explained on the one hand by their abundance and on the other hand by their availability and relatively easy handling [14]. Drug recipes are generally obtained by decoction (53.65%). The decoction, which is an empirical practice, is made at a high temperature from cold water. According to [7], it has the advantage of neutralizing pathogens and making the preparation healthy. However, the rise in temperature could lead to the loss of substances of interest from the plant that could reduce the biological activity of the drug. Moreover, the set of products obtained from the drugs from the plants listed, that is., the powder, the grind, the maceration and the juice, depends on the type of pathology to be treated. Often for the preparation of certain remedies, farmers and healers add certain ingredients to the drugs, such as vinegar, fresh eggs, millet flour, corn flour and lemon. The purpose of making this composition is to make it pleasant to ingest the drugs, which sometimes have a bitter taste [12]. This preparation process clearly shows the mastery of the effectiveness of the methods used by these herders and pastoralists in the treatment of livestock diseases. The method of administration mainly used is the oral route with a percentage of 93% [15]. This result also reflects that of [16], who in his work on plants indicated as anti-anthelmintic, revealed that the oral route is the most appropriate in traditional phytotherapy. However, other methods such as fumigation, cataplasm and local applications are also used. Among the 25 plants obtained during this study, 7 species were identified by the studies of [12]. Among these 7 species, only 2 corroborate our study, because of their use to control diarrhoea (*Vitellaria paradoxa*) and intestinal worms (*Khaya senegalensis* and *Vitellaria paradoxa*) in cattle. The other 5 have prescriptions contrary to those obtained in this study.

5 Conclusion

This study showed that, out of the inventory of current knowledge on veterinary medicinal plants in the department of Ferkessédougou, 25 plants are used in cattle health care, with the family Meliaceae having more species. A total of 15 veterinary pathologies were mentioned by herders and healers, of which diarrhoea and malaria are the most common. This study has led to the understanding that leaves and then bark and fruit are the most commonly used parts in the preparation of remedies. In addition, it showed that decoction is the method of preparation and the oral route is the method of administration of herbal products. This observation justifies both the need and the urgency of conducting large-scale ethno-veterinary studies to safeguard what remains of local knowledge which is in danger of disappearing for good.

Compliance with ethical standards

Acknowledgments

The authors would like to thank the Direction des Eaux et Forêts and SODEFOR for their material and technical support. They also express their gratitude to the herders and healers who contributed to this study.

Disclosure of conflict of interest

The authors declare no conflict of interest.

Author's contributions

CK: validation of the research protocol, execution of the work, writing and correction of the manuscript; KKHC: execution of the work, identification of the plants, correction of the manuscript; SY: support to the bibliographical

research, data collection and correction of the manuscript; ZGN support to the elaboration of the whole document by closely supervising all the work contributing to the manuscript.

Statement of informed consent

Each actor interviewed gave their consent deliberately and was willing to answer the different questions.

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How to cite this article

Coulibaly K, Koné Kéassemon HC, Sanogo Y and Zirihi GN. (2020). Traditional medicine in the treatment of bovine diseases in Northern Côte d'Ivoire. World Journal of Advanced Research and Reviews, 6(2), 103-110.
